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THE COMMON WOMBAT *VOMBATUS URSINUS* (SHAW, 1800) IN NORTHERN TASMANIA — PART 1. BREEDING, GROWTH AND DEVELOPMENT

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SUMMARY

Two hundred and ninety one sub-adult and adult wombats were salvaged from a population reduction programme over six months in 1979-80. One hundred and twelve were males and 179 were females. One carried a full term foetus and 58 carried young-in-pouch. From this material and previously published data, a scale of growth, development and age has been established for pouch young, juveniles and sub-adults. There was no significant difference between the total lengths or weights of males and females.

The lips of pouch young were forming and separating at about twelve weeks, after which the young could voluntarily detach from the nipple. From about 24 weeks the teeth erupted and some vegetable food was eaten. From 28 weeks the young could leave the pouch for short periods and by 50 weeks they could be independent, but some young remained with their mother for a longer time.

Births occurred in every month but there was a bias towards the four month period of October to January when about 48% of young were born. The smallest wombat with young in pouch weighed 15.4kg and was estimated to be 85 weeks of age but most were several kilograms heavier and presumably older when they produced their first offspring.

Initial pouch development was posterior to the opening but as breeding neared, the pouch also developed depth laterally. The young was first carried in one side of the pouch and as it grew so the pouch enlarged anteriorly, laterally and posteriorly.

There was no evidence of embryonic diapause or pregnancy during lactation. Suckling could continue for up to a year and the breeding cycle appeared to be somewhat greater than one year.

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INTRODUCTION

The Common Wombat *Vombatus ursinus* (Shaw, 1800) is widely distributed through Eastern New South Wales, Western Victoria and Tasmania with a few isolated populations in South-eastern South Australia. The Flinders Island population *V. u. ursinus* and the Tasmanian population *V. u. tasmaniensis* are considered as sub-species (McIlroy, 1983). It once occurred on King Island but died out there early in the nineteenth century.

In Tasmania the wombat is widely distributed and common, particularly in some northern coastal regions where the soil is sandy and burrows are easily excavated. Its favoured habitats are dry sclerophyll forest, heathland and dense scrub, especially near to grassy areas where it finds good grazing. McIlroy (1983) stated "The main food is native grasses but also includes sedges, matrushes, and the roots of shrubs and trees". This may be true in areas where introduced crops or pasture are not available but the wombats, like other grazing marsupials, much prefer the introduced pastures and will travel considerable distances to feed there.

One such locality which has for many years supported a very vigorous marsupial fauna, especially of wombats, extends westwards from the estuary of the Tamar River to the Asbestos Range, Lat $41^{\circ} 42'$, Long $146^{\circ} 08'$. (See map, Figure 1). It comprises about 7,000 hectares of low, forested hills and broad valleys, some of which have been selectively cleared

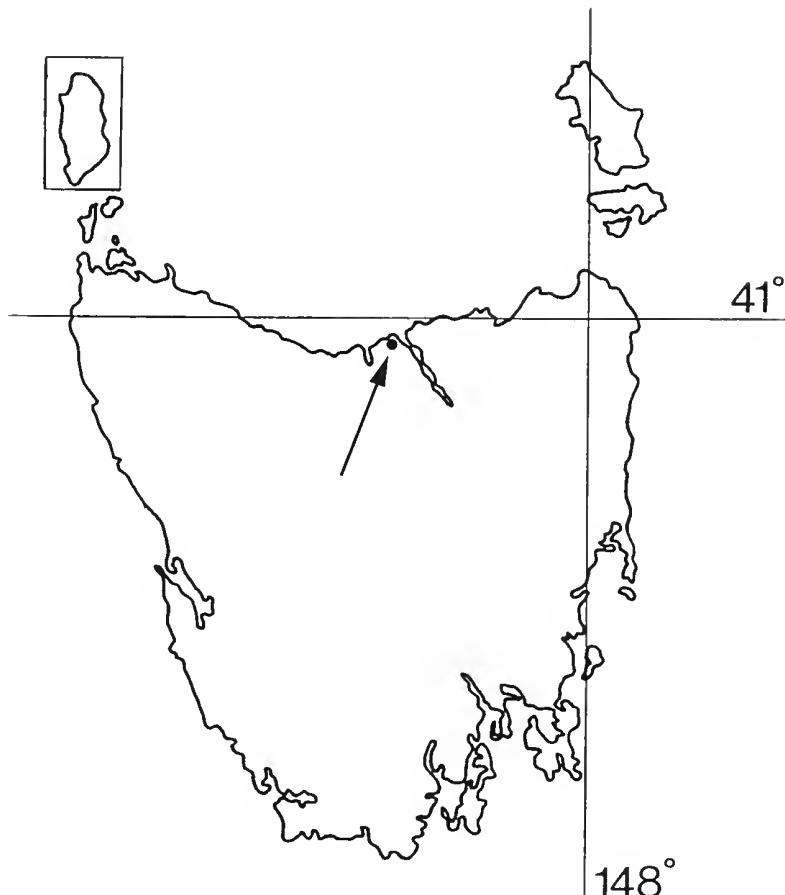


Figure 1. Tasmania and the site of "Bel Respiro" where the wombats were collected.

and sown to improved pasture for cattle and sheep grazing. These cleared areas of grassland are mostly surrounded by dense tea-tree sens. lat. *Melaleuca* and *Leptospermum* spp., introduced gorse *Ulex europaeus* and gum trees *Eucalyptus* spp. (Plate 1) beneath which wombats and wallabies have formed well defined runways leading to secluded diurnal retreats. Some runways lead to deep burrows excavated by wombats in the sandy soil (Plate 2). Burrows were also excavated in open pasture areas where they are a hazard for farm vehicles and domestic stock.



Plate 1. Introduced pasture bordered by gorse on "Bel Respiro", Greens Beach, a section of the area where wombats were collected.



Plate 2. A typical wombat burrow in sandy soil beneath teatree scrub bordering pasture land on "Bel Respiro", Greens Beach.

The property "Bel Respiro", in the centre of this region, includes about 800 hectares of improved pasture where grazing marsupials have, for many years, been in such numbers as to occasionally become a pest.

In 1979 the owners obtained a permit to reduce wombat numbers by shooting and the opportunity was taken by the senior author to salvage some of the material. The work was carried out between 15 November 1979 and 22 May 1980 when 291 sub-adult and adult wombats (112 males and 179 females) were collected. The programme was terminated when the onset of winter rains made the pasture paddocks too wet to carry a vehicle. Wombats were still plentiful and it was estimated that the 800 hectares over which the collecting was carried out must have supported considerably in excess of 1000 adult wombats at the commencement of the culling programme.

MATERIALS AND METHODS

Collecting was undertaken once each week by spotlighting from a stationwagon and shooting with a 0.22 Magnum rifle fitted with a telescopic sight. Twelve to 20 wombats were shot on each occasion and the carcasses held overnight and processed the following morning.

Each was given a field number, weighed and total head and body length measured. Heads were removed and the skulls later cleaned by cooking. Urino-genital organs of females were collected, fixed in 4% formalin and preserved in 70% alcohol for later studies. Testes of some were collected, photographed and similarly preserved.

Pouch young were weighed, measured and notes on their development recorded before preservation in 70% alcohol or being deep frozen for skeletal preparations.

The points between which the length of the young were measured could vary according to age and development. In the first week or so of pouch life the face was turned ventrally and a rather curled, beanshape was assumed. The greatest length was then taken from the crown to the rump. When about six weeks of age the spinal region became more flexible and the young could be straightened. From that stage the total length was recorded from nose to tail tip.

Ectoparasites (fleas, lice and ticks) were collected from many wombats for studies elsewhere. Endoparasites, blood, liver, heart, lung, kidney and diseased tissue samples were collected for pathology studies at the Mt. Pleasant Laboratories, Tasmanian Department of Agriculture.

Total thyroids were collected for the Department of Nuclear Medicine, Launceston General Hospital for microscopic sectioning as part of a study into the incidence of possible thyroid disorders in this indigenous marsupial. All the samples were found to fall within normal limits and no evidence of thyroid disease was detected (unpublished data). The sections are presently held in the above Department (pers. comm. Paul Richards).

A series of pouch young has been loaned to the Zoology Department, University of New South Wales to help in a study to determine the true homology of the bones of the basicranial region in vombatids as well as to determine how the relatively specialised floor of the vombatid ear region ontogenetically develops.

In August 1982 a further 59 Common Wombats were collected on Flinders Island and were similarly processed for comparison with the "Bel Respiro" data. These will be treated later.

AGEING OF YOUNG

A few authors have given fragmented information on rates of growth and development. Following studies of free ranging wombats in the Bondo area, Southern New South Wales, McIlroy (1973) recorded the growth and development of a pouch young over a period of about 434 days during which time he recaptured the animal and recorded its development on five occasions. Presidente (1983) gave some growth and development data for two pouch young maintained by their captive mothers during his studies at Werribee, Victoria. Conder (1970) recorded the successful breeding of a Common Wombat in the Sir Colin McKenzie Sanctuary, Healsville, Victoria, where mating was noted on 9 June 1969 and a young was first noticed in the pouch in December. In early April this young weighed 3.2 kg and assuming it was a product

of the 9 June mating, would have been about 38 weeks of age, (nine months) and not 42 weeks (10 months) as interpreted by McIlroy (1973) who apparently included the gestation period in the age.

To enable us to determine the age of young wombats we first plotted all our data on weights and head and body lengths in the form of a graph (Figure 2). To this we appended the associated development of factors such as facial features, fur and teeth (Figure 3).

We then overlaid our graph with the data on growth and development rates recorded by McIlroy (1973), Presidente (1983) and Conder (1970) who gave time spans between some development stages. This enabled us to establish a rate of growth for our material as shown in Figure 2 and by extending this graph we believe we have an ageing scale to 85 weeks, accurate to within the limits of normal variation between individuals in similar age groups.

BREEDING

Little has been published on the breeding of the Common Wombat and suggestions of a restricted breeding season by such authors as Troughton (1957), Nicholson (1963), Green (1973), Peters and Rose (1979) were of necessity, based upon limited material.

Gestation has never been accurately determined but is probably near to four weeks as Peters and Rose (1979) gave the oestrous cycle as 33 days and gestation in most marsupials is of a lesser period than the oestrous cycle (Tyndale-Biscoe 1973, pp 38 and 53).

By reference to Figures 2 and 3 and Table 1 we were able to assess the approximate birth date of all our pouch young, juvenile and sub-adult specimens and these have been presented in the histogram (Figure 4). This illustrates that the "Bel Respiro" wombats produced young in all months but with a bias towards birth occurring in Spring and early Summer, from the beginning of October to the end of January.

About 48% of births occurred within this 17 week period, a time when pasture growth is at its peak. A secondary peak occurred in the Autumn, perhaps a result of a flush of green feed following Autumn rains after the dry Summer.

As wombats are not weaned to a vegetable diet until nine to 12 months old the production of young in these peak periods would be favourable to their feeding requirements as they became independent of their mothers. Tyndale-Biscoe (1973, p 130) explained how many animals bred at times such that their young could benefit from optimal seasonal conditions coinciding with weaning and independence.

This pattern of birth dates probably occurs throughout the island with the possible exception of populations in the colder highlands where births could occur later. This assumption is supported by McIlroy (1973) who believed matings occurred later in the more southerly (and presumably colder) regions. In his study area at Bondo, Southern New South Wales (near Canberra) he found birth to occur mostly from December to March. This is about two months later than the optimum time at "Bel Respiro" where the milder coastal climate could favour earlier breeding.

No multiple births were recorded. One wombat with a full-term foetus was collected on 21 February (paps. preps. R. L. Hughes). The smallest, lightest and presumably youngest wombat with a young in pouch weighed 15.4kg and is estimated to have been about 85 weeks of age. One which weighed 23.3kg appeared to have never suckled young as both nipples were undeveloped and less than 5mm long. Of the 148 adult female wombats 43 (30%) showed no evidence of having suckled young. These were mostly smaller and apparently younger animals in a weight range of between 15 and 21kg. Fifty one (35%) of the adult females over 15kg carried young in the pouch, 27 (18%) were with young at foot, without young but still lactating or in a post lactating, regressing condition, and 27 (18%) had bred but lactation had since ceased and the pouch and nipples had regressed. Only one over 23kg had not suckled a young (Table 2).

Females numerically exceeded males by a significant proportion which was constant in all age groups (Table 3) but this did not appear to result in unproductive females (Table 2). Males were only very slightly longer than females but body weight was almost equal (Table 4).

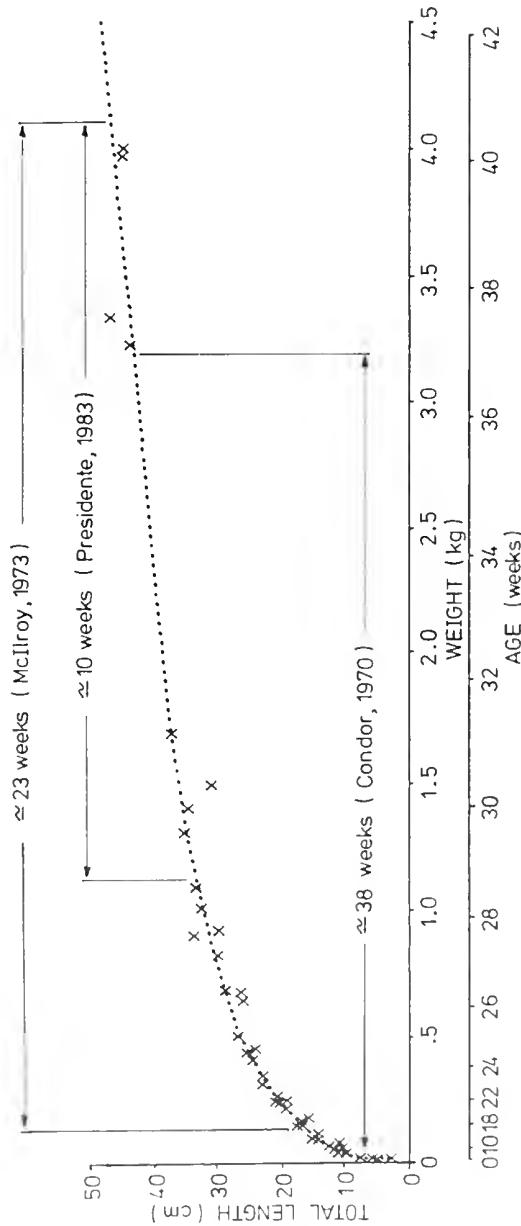


Figure 2. Total lengths and weights of young wombats from "Bei Respiro" with an age scale to 42 weeks interpreted from growth and development data obtained from wombats studied by McIlroy (1973), Presidente (1983) and Conder (1970). Statistics from an extension of this graph to 85 weeks, are included in Table 1.

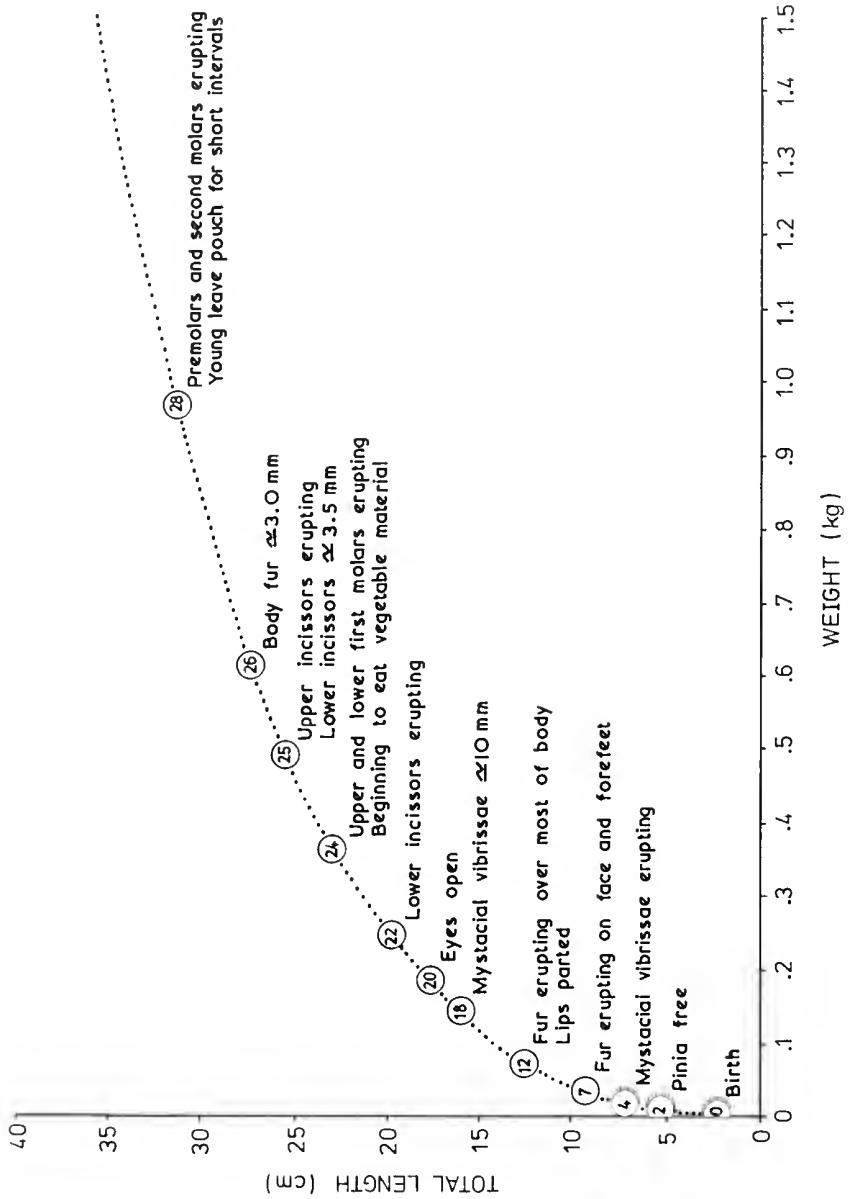


Figure 3. An enlargement of the total length/weight curve of Figure 2 to 30 weeks showing the development of features with growth, in weeks.

AGE	WT.	T.L.	AGE	WT.	T.L.	AGE	WT.	T.L.	AGE	WT.	T.L.
0	.00072	2.5	22	.25	20.4	44	4.96	49.3	65	10.34	65.0
1	.004	4.4	23	.295	21.7	45	5.20	50.0	66	10.6	65.7
2	.008	5.8	24	.370	23.8	46	5.47	51.0	67	10.85	66.3
3	.013	6.7	25	.483	25.8	47	5.23	51.8	68	11.12	67.1
4	.017	7.6	26	.612	28.0	48	5.98	52.6	69	11.37	67.8
5	.023	8.4	27	.775	30.3	49	6.23	53.3	70	11.63	68.5
6	.028	8.9	28	.962	32.3	50	6.49	54.0	71	11.88	69.1
7	.034	9.6	29	1.06	34.0	51	6.75	55.0	72	12.15	69.8
8	.042	10.3	30	1.4	35.8	52	7.01	55.8	73	12.4	70.6
9	.048	11.0	31	1.65	36.7	53	7.26	56.4	74	12.66	71.1
10	.054	11.4	32	1.9	37.8	54	7.52	57.1	75	12.91	71.8
11	.062	11.9	33	2.15	39.0	55	7.76	58.0	76	13.15	72.2
12	.072	12.5	34	2.41	40.0	56	8.08	58.6	77	13.43	72.7
13	.084	13.4	35	2.67	41.0	57	8.29	59.3	78	13.69	73.0
14	.095	14.1	36	2.93	42.3	58	8.59	60.0	79	13.96	73.6
15	.108	14.7	37	3.18	43.2	59	8.8	60.7	80	14.20	74.2
16	.120	15.3	38	3.44	44.5	60	9.06	61.5	81	14.46	74.6
17	.135	16.0	39	3.69	45.7	61	9.32	62.2	82	14.72	75.1
18	.151	16.7	40	3.95	46.4	62	9.58	63.0	83	14.97	75.4
19	.170	17.7	41	4.19	47.1	63	9.83	63.9	84	15.23	76.1
20	.194	18.4	42	4.49	48.0	64	10.09	64.3	85	15.49	76.6
21	.218	19.3	43	4.70	48.8						

Table 1. Total length (cm) and weight (kg) co-ordinates of wombats in weekly intervals interpreted from the growth/age scale in Figure 2 plus an extension from 42 weeks to 85 weeks not illustrated.

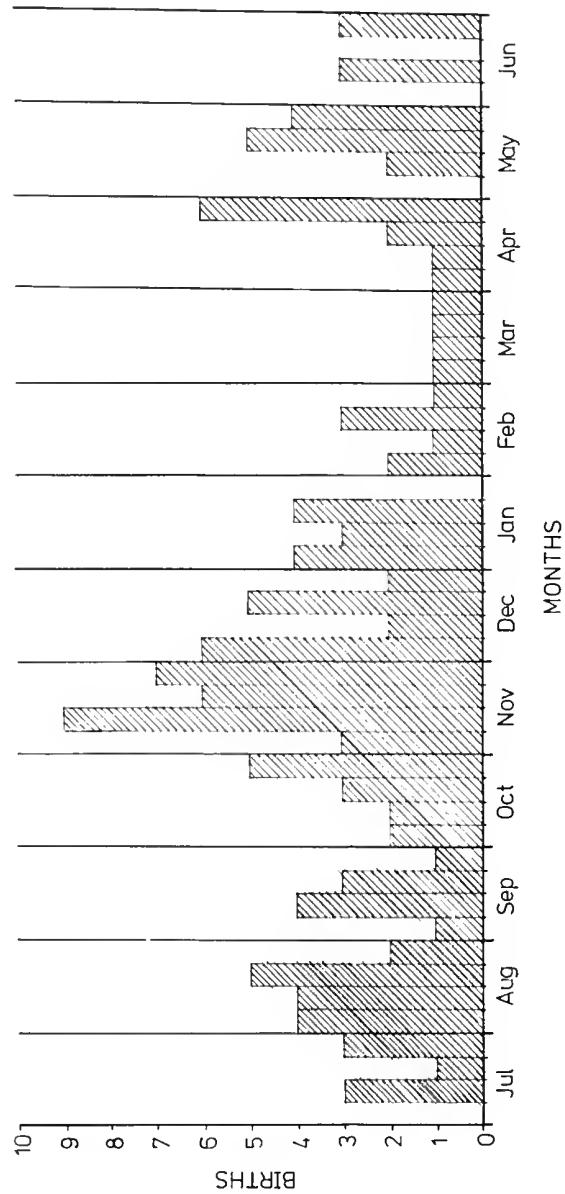


Figure 4. The estimated birth times of pouch young, juvenile and sub-adult wombats collected at "Bel Respiro", based upon the growth curve in Figure 2 and statistics in Table 1.

The Common Wombat *Vombatus ursinus* (Shaw, 1800) in
Northern Tasmania — Part 1. Breeding, Growth and Development

WT. (KG.)	NUMBER	UNDEVELOPED	WITH P/Y	NO. P/Y LACT.	POST BREEDING
15—16.9	18	14 (78)	2 (11)	2 (11)	0 (C)
17—18.9	41	17 (42)	12 (29)	8 (20)	4 (9)
19—20.9	50	10 (20)	15 (30)	12 (24)	13 (26)
21—22.9	27	1 (4)	17 (63)	3 (11)	6 (22)
23+	12	1 (8)	5 (42)	2 (17)	4 (33)
TOTAL	148	43 (30)	51 (34)	27 (18)	27 (18)

Table 2. Breeding condition of 148 female wombats in five weight classes. Undeveloped means appeared to have never bred, pouch and/or nipples undeveloped. With P/Y included all with pouch dependant young. No P/Y lact. were those animals without young but with an enlarged nipple from which milk could be expressed. Post breeding included those which had previously carried young in pouch but were then no longer lactating. The number in parenthesis is the percentage.

CLASS	MALES	FEMALES
P/Y	25 (40)	30 (60)
Juvenile	11 (52)	10 (48)
Sub. Adult	16 (33)	31 (67)
Adult	96 (39)	148 (61)
TOTAL	148 (40)	219 (60)

Table 3. The number and percentage (in parenthesis) of males and females in each of the four age classes from a total of 367 wombats from "Bel Respiro".

	♂ ♂				♀ ♀			
	RANGE	MEAN	S.E.	NO.	RANGE	MEAN	S.E.	NO.
SUB ADULT								
T. Length (cm)	66—80	69.75	3.19	16	63—78	70.12	4.28	31
Weight (kg)	10.0—14.9	12.49	1.04	16	10.0—14.9	12.35	2.36	31
ADULT								
T. Length (cm)	73—90	81.26	3.37	96	72—89	80.8	3.32	148
Weight (kg)	15.0—26.6	19.5	2.18	96	15.0—26.2	19.55	2.34	148

Table 4. Size range of 291 sub-adult and adult wombats from "Bel Respiro"

GROWTH AND DEVELOPMENT

The following descriptions are based upon young wombats, the ages of which have been estimated from weights and head and body lengths as presented in Figure 2. Some further statistics are given in Table 1.

When first born (Plate 3) they had a crown to rump length of 1.5cm. The lower jaw was relatively large and the nose and facial features appeared swollen. The facial region was about 4.3mm dorso-ventrally and of greater proportions than the rest of the head. The cranial region appeared little more than an extension of the neck. The eyes were barely discernible as pale grey subcutaneous spots. The ears were completely sealed and represented only by barely noticeable lumps. The lips were fused laterally, the mouth opening being about 1.3mm in diameter. Teeth were absent and the nostrils situated laterally on the front of the face and about 1mm in diameter.

The fore limbs were relatively stout and well developed, each with five well formed digits equipped with prominent, strongly hooked but not deciduous, claws. By comparison the hind limbs appeared weak and undeveloped, the first digit being a mere bud and the remaining four lacking form or claws.

The genitalia protruded prominently for about 1mm and was about equal length to the free tail. The scrotum and pouch were not readily discernible.

When 2.3cm long (about one week) the facial region remained about the same proportions as at birth but the rest of the head had developed to about double its birth size. The cranial region had swollen so that the posterior half of the head was then larger than the anterior half. The genitalia lacked pigment and was about twice the size of the tail.

When 3.4cm long (about two weeks, Plate 4a) the eyelids were forming and the juncture appeared as a faint grey crease. The pinea of the ears had grown free from the head. The first digits of the hind feet remained as mere buds but the others had developed curved claws. The tip of the genitalia had developed a grey pigmentation and the scrotum and pouch were obvious.



Plate 3. A pouch young wombat soon after birth and attachment to a nipple, at which age it had a crown-rump length of about 2.5cm

When 5.3cm long (about four weeks, Plate 4b) a pale grey pigmentation had developed in the skin of the face especially in the region where the mystacial vibrissae had just erupted. The eyelids were still fused but the juncture had darkened to a mid grey. The nose had some pale grey pigmentation and had developed its characteristic form. The hind limbs, though still very much smaller than the fore limbs, were well developed as also were the pads and claws on both the manus and pes. The genitalia was prominent, being as long but more massive than the tail and the terminal half was dark grey.

When 8.9cm long (about six weeks) the facial vibrissae had erupted and were obvious to the naked eye. The nose and claws were developing a pale grey pigmentation. The thoracic region was still about twice the size of the pelvic region. The pouch was well developed, and appeared as a 2mm anterior-posterior slit and with a depth of about 2mm. The scrotum was of similar proportions.

When 10.3cm long (about eight weeks, Plate 4c) hair had erupted on the face, top of the head and toes of the front feet. The lips were well developed but still sealed laterally by soft tissue.

When 12.5cm long (about 12 weeks, Plate 4d) the fur was just erupting (to 0.1mm) over most of the body but mostly so on the facial region, ear pinea and front feet. The nose and claws were pale grey. The lips had parted laterally after which the young could voluntarily detach from the nipple. The ears were open but had a swollen appearance. The eyelids were swollen and sealed, the juncture appeared as a grey crease above which were a few vibrissae like hairs. The fontanelle was obvious and appeared as a pale grey indentation in the middle of the crown. The grey-tipped genitalia protruded beyond its sheath by about 2mm.

When 15.3cm long (about 16 weeks) the fur had erupted all over the body but was mostly unpigmented and still not visible to the naked eye, except on the facial region, ear pinea and feet where it was a pale grey and about 0.5mm long. The lower incisor teeth were beginning to develop and lift the gum but had not erupted. The genitalia had withdrawn and only 1mm protruded beyond the cloacal rim. A small tick was found attached to the belly of a pouch young of this age.

When 18.5cm long (about 20 weeks, Plate 5a) the young still appeared naked but under magnification were found to have fur well erupted everywhere. The fur was unpigmented except in the region of the face, ear pinea and feet where it was grey, so that these parts had a slightly greyish appearance. The eyes had just opened. All the claws were grey as also was the nose between the nostrils. The lower incisors still had not broken through the skin but stood to about 2mm above the gum line. The fontanelle was obvious and appeared as a dark grey depression. The grey tipped genitalia protruded 1mm beyond its sheath which was 3mm beyond the anal rim, completely filling the cloacal aperture.

When 23cm long (about 24 weeks, Plate 5b) the fur was up to 1mm long and both skin and fur had grey pigmentation. An abrupt hair line had formed where the hair on top of the feet gave way to the granular pink pads. The lower incisors had broken through the skin and about 2mm of the tips were exposed. The upper incisors were present but still within the gum. The upper and lower first molars were beginning to break through the gums. The tips of the claws on the manus were losing their sharp points and becoming blunt as if some wear had occurred. The genitalia was usually withdrawn within the cloaca around which were some hairs up to 4mm long. Nipples had formed as 1mm buds and the pouch was about 6mm deep and enveloped by lateral flaps to form an 8mm cleavage. The intestines contained particles of sand and some fibrous vegetable material as well as milk and were becoming grey in appearance, indicating the young had commenced to nibble at grass by reaching from the pouch.

When 32cm long (about 28 weeks, Plate 5c) the fur ranged from 5 to 10mm long being longest on top of the shoulders and shortest on the forehead, rump and belly. Guard hairs were somewhat longer than the fur. The general colour was grey dorsally and pale cream ventrally.

Claws were grey, being paler distally, pads were a very pale grey and the nose was an even grey all over. Upper incisors were exposed for 6mm and the lower incisors for 7mm. They met evenly and the tips had worn to a flat surface. Upper and lower premolars and first and second molars had just erupted. The gut was grey and contained much fibrous vegetable material. At this age the young could leave the pouch for intervals but quickly returned if alarmed.

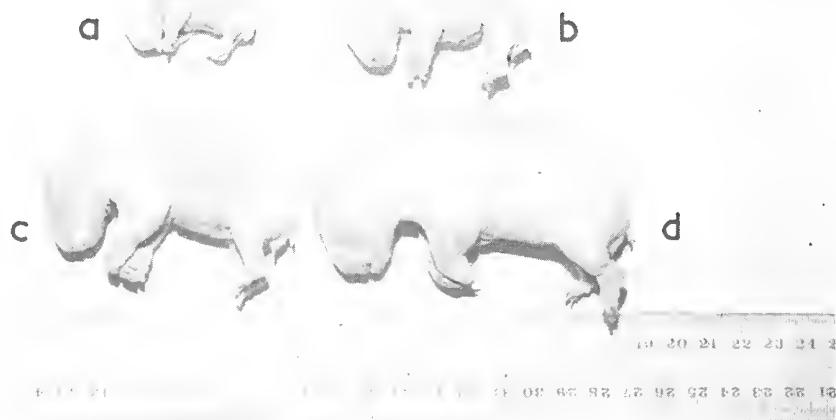


Plate 4. Pouch young wombats at an age of about two weeks (a); four weeks (b); eight weeks (c) and 12 weeks (d).



Plate 5. Pouch young wombats at an age of about 22 weeks (a); 24 weeks (b) and 28 weeks (c).

When 38cm long (about 32 weeks) the fur was up to 20mm long on the shoulders and 12mm on the rump with guard hairs longer. It was a mid grey colour everywhere except on the cheeks and throat where it was silver-grey. Claws were dark grey, pads mid grey and nose dark grey all over. The upper incisors were exposed for 7mm and the lower for 10mm. Molars and premolars were up to 4mm above the inside gum line and all were ground to an almost flat surface. The intestines appeared dark grey and contained vegetable matter and the lower bowel occasionally contained well formed faecal pellets about 18mm long and 13mm in diameter. The young could regularly and with ease, leave and re-enter the pouch.

When 45cm long (about 40 weeks) the young usually ran as a "joey" at foot and could become independent of the pouch and its mother's milk supply. The fur was to 25mm long on the shoulders with guard hairs to 40mm. On the rump the fur stood to 18mm with guard hairs to 30mm. Fur colour was an even dark grey except on the throat where it was slightly paler. The claws, nose and pads were a very dark grey. Upper incisors were exposed for 9mm and the lower for 12mm.

When 55cm long (about 50 weeks) the fur on the shoulders had grown to 30mm long with guard hairs to 40mm and the colour was dark grey all over the body, including the throat. Upper incisors were exposed for 10mm and the lower for 13mm. The young wombat was then free ranging and usually alone and independent, but some individuals remained in company with their mother for longer.

Older than one year. To assess the percentage of wombats in different age groups we divided the animals into four classes as defined in Table 5. All below 3kg we classed as pouch-dependent young, being of an estimated age of less than thirty eight weeks (9 months). From this age they ate grass and started to gain independence and were classed as juveniles. Our juvenile group represented mostly "joey's" at foot which ranged up to 10kg and were estimated to not exceed sixty five weeks (15 months). The sub-adult group brings together wombats from independence to the start of breeding at about 15kg or about eighty three weeks (20 months). All wombats that weighed more than 15kg have been classed as adults.

Mortality rates, with age progression should not be deduced from an analysis of Table 5 as influences such as times of year, seasonal conditions and pest control activities would render such a deduction invalid.

CLASS	AGE (weeks)	WEIGHT (kg)	NUMBER
P/Y	0 — 37.9	0 — 2.9	58 (16)
Juvenile	38 — 64.9	3.0 — 9.9	21 (6)
Sub. Adult	65 — 82.9	10.0 — 14.9	47 (13)
Adult	83 +	15 +	244 (65)

Table 5. The number and percentage (in parenthesis) in each of four age classes (based upon body weights) from a total of 370 wombats collected at "Bel Respiro" between 15 November 1979 and 2 May 1980.

THE POUCH

Pouch development varied considerably between individuals, some appearing more advanced for their age than others. In sub-adults of about 10kg the pouch had developed only slightly and posteriorly to the opening (Plate 6), with a depth of about 10mm and the nipples inverted (Plate 7). As the wombat grew so the pouch developed and at about 15kg it could be up to 50mm deep with an opening of similar diameter, the nipples still inverted and the pouch soiled (Plate 8).

With the approach of sexual maturity the pouch developed laterally, up to 50mm deep, but often more so on one side than the other (Plate 9). The nipples then became everted to a length of about 5mm.

Before the young was born the pouch was cleaned, presumably having been licked by the female, and contractile muscles closed the opening to protect the pouch environment.

While the young was naked and relatively small, pouch distension was greatest laterally and the young was carried to one side of the opening, not necessarily on the same side as the nipple to which it was attached (Plate 10). The pouch later began to develop anteriorly of the opening. As the young grew, became detached from the nipple, developed fur and had a need for more room the pouch distended up to 120mm in any or all directions from the mid point of the opening, the degree and direction of distension being variable between individuals.

When the young approached the age of independence the depth of the anterior pouch development usually slightly exceeded dimensions in other directions (Plate 11). The young then needed all the available pouch space and was supported and held by contraction of the muscle around the pouch opening. In the last few weeks of pouch occupancy closure could be incomplete, the opening being blocked by the young's rump.

Lactation occurred only on the side of suckling and that nipple could be distended to 85mm long before the young was weaned. The unoccupied nipple remained at about 5mm. Some young apparently continued to suckle after deserting the pouch as some adults were found to have dirty and apparently vacated pouches but with one distended nipple still slightly lactating and clean (Plate 12).

After weaning, the pouch and recently suckled nipple gradually regressed and became dirty but for some time the nipple could still be easily stretched out to its former length. Subsequent young attached to the smaller nipple.

We found no evidence of embryonic diapause or of pregnancy reoccurring during lactation. Lactation and suckling could continue for up to almost a year and was generally followed by a period of rest. In the "Bel Respiro" sample 18% of adult females had just weaned or were near to weaning young and a further 18% had carried young but were no longer lactating (Table 2). It therefore appears that the Common Wombat does not produce a young annually but the breeding cycle is of a somewhat greater and presently undetermined period of time.



Plate 6. The pouch of a sub-adult wombat of a body weight of about 12kg. At this stage development had just started, posterior to the opening.



Plate 7. The pouch of a sub-adult wombat of about 12kg with the slight posterior fold pulled back to show the two inverted nipples.

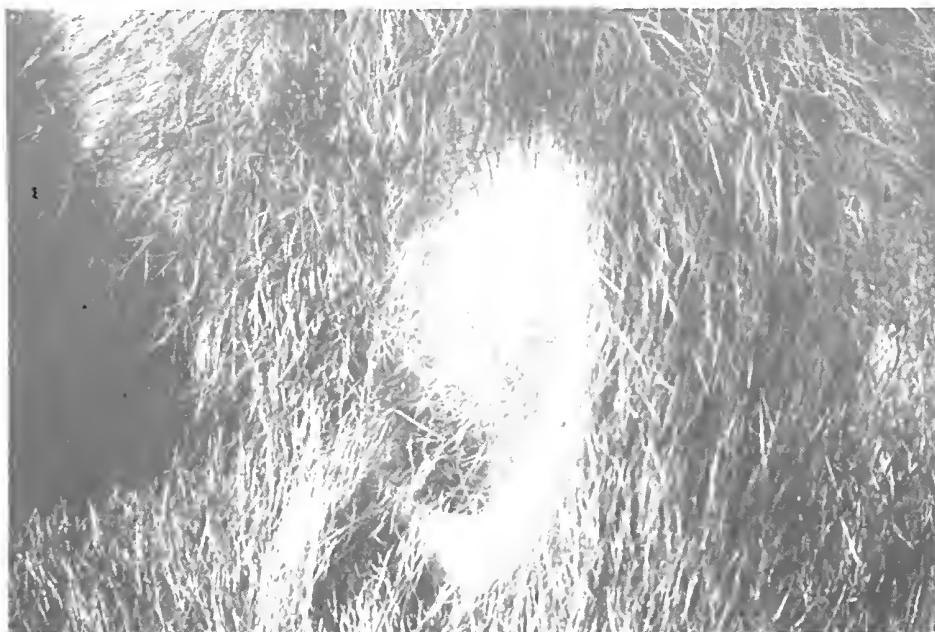


Plate 8. The pouch of a wombat of about 16kg at which stage it had a depth, posterior to the opening, of about 50mm.



Plate 9. The pouch of a wombat near to sexual maturity; it had developed laterally and posteriorly, to depths of about 50mm.

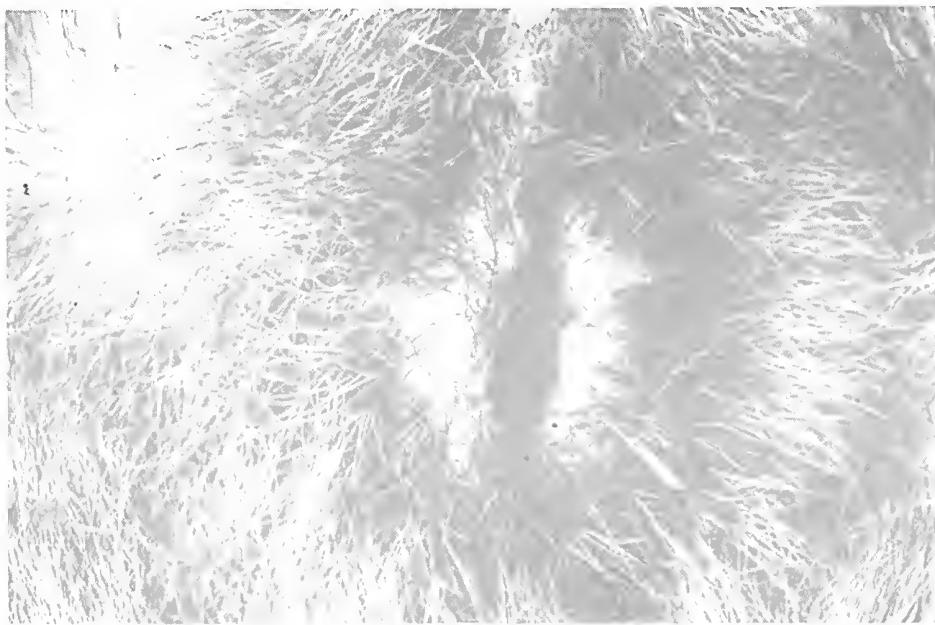


Plate 10. The pouch of a wombat carrying a young about 19 weeks old (0.17kg). The right nipple, to which it was attached was 55mm long and this young was being supported on the right side of the pouch which had a depth of about 80mm.



Plate 11. The pouch of a wombat carrying a young about 29 weeks old (1.08kg). It was suckling the right nipple which was about 70mm long. The pouch had developed around the opening to depths of about 110mm anteriorly, 70mm posteriorly and 100mm laterally.



Plate 12. The pouch of a wombat which had been recently vacated. The right nipple was about 55mm long, still lactating and clean. The pouch was dirty and had depths of about 20mm anteriorly, 30mm posteriorly and 30mm left laterally and 50mm right laterally

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REFERENCES

Conder, P. 1970. Breeding of Common Wombat in Captivity. *Vict. Nat.* 87: 322.
Green, R. H. 1973. *The Mammals of Tasmania*. Launceston. The Editor.
McIlroy, J. C. 1973. Aspects of the ecology of the common wombat, *Vombatus ursinus* (Shaw, 1800) Ph.D. Thesis, Australian National University.
McIlroy, J. C. 1983. Common Wombat *Vombatus ursinus* in *Complete Book of Australian Mammals*, pp 117—119. Edited by Ronald Strahan. Sydney, Angus and Robertson.
Nicholson, P. J. 1963. Wombats. *Timbertop Mag.* 8: 32—38.
Peters, D. G. and Rose, R. W. 1979. The oestrous cycle of basal body temperature in the common wombat (*Vombatus ursinus*) *J Reprod. Fert.* (1979) 57, 453—460.
Presidente, P. J. A. 1983. Common Wombat *Vombatus ursinus*: maintenance in captivity, blood value, infectious and parasitic diseases. *The Management of Australian Mammals in Captivity*. D.D. Evans, Ed.
Tyndale-Biscoe, Hugh 1973. *Life of Marsupials*. Canberra, Australian National University.

